

Tangka'an Marine Protected Area monitoring results 2005-2006



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1 - Introduction to Coral Cay Conservation

CCC has carried out marine conservation projects all over the world, including in the Philippines, Belize, Honduras, Malaysia and Fiji. CCC successfully set up Marine Protected Areas and provided scientific data that has been used to manage local marine resources. The project in Danjungan Island in the Philippines between the years 1996-1999 was particularly successful and the reefs around the island recently received the accolade of Best Managed Reef of the World. Since 1995, CCC has worked with the Philippine Reef and Rainforest Conservation Foundation Inc. (PRRCFI) and local communities to survey and safeguard reef and rainforest areas in the Philippines. To date these have included coastal regions of the Southern Negros Occidental, Anilao, Palawan, Danjungan Island and the forests of North Negros. At the invitation of the Provincial Government of Southern Leyte, CCC began its survey work in Sogod Bay in September 1999. CCC is conducting a collaborative program to survey the region's coral reefs and provide training and conservation education opportunities for project counterparts. The aim is to develop local capacity and ensure the long-term protection and sustainable use of marine resources throughout Southern Leyte. We are hoping that we can build on our previous successes, extending our stay here in Southern Leyte.

The Philippines is renowned for its rich marine environment but with as much as 97% of its reefs at risk, immediate conservation action is needed. Children living in coastal areas are recognized as the future stewards of their marine resources and CCC is working closely with this local stakeholder group to raise awareness and increase understanding of the need for greater conservation efforts in the Philippines.

2 - Tangka'an MPA

In May of 2005, four Marine Protected Areas (MPAs) were installed in the municipality of Padre Burgos. The Barangays of Buenavista, Santa Sofia, Lungsoda'an and Tangka'an have all set aside a small part of their coastal reef to allow fish stocks to recover and conserve the rich marine life that each of the areas support.

The MPA of Tangka'an is approximately 6 ha large and is a community based MPA. This means that the Barangay community with an emphasis on the fisherfolk have been involved in setting up the MPA and their opinion and advice was used in the deciding on the location of the MPA. Furthermore, they were invited to a seminar about the importance of marine sanctuaries for sustainable fisheries and future livelihoods as fishermen. Municipal council members and other stakeholders, Barangay captains and representatives from CCC paid a visit to Apo Island Marine Reserve off the coast of Dumaguete to have a first-hand look at how a successful marine reserve operates and can be a major source of income and provide an alternative livelihood for the community. On the basis of this excursion, plans were developed to do something similar in Padre Burgos. Diving is restricted in the MPAs and a small fee of 50 pesos has to be paid per diver. This income goes to managing the MPA. The increase in diving eco-tourism in Sogod Bay makes the MPAs a potential source of

income in the near future. Already, the MPAs are proving their value, offering some fantastic diving. This more than anything else, may help continue the momentum in preserving the rich marine resources of Sogod Bay in general and Padre Burgos in particular. The long term effects will lead to improved fish catch outside of the MPAs as has been shown in Sumilon Island; the first community based MPA that saw local fish stocks doubling within 10 years. Only with the full support of the community and upholding of the regulations and laws that apply within the sanctuary will the benefits become evident over the next years.



Fig. 2.1. Locations of four MPAs in Padre Burgos.

3 - Marine Protected Areas

MPAs are an important management and conservation tool in protecting existing fish stocks and helping them to recover. In addition to this, they allow coral reefs to grow and pristine reefs are protected from harmful human actions. Over a few years we can already begin to see the benefits that properly managed MPAs provide. A ‘spill over’ of fish from within the MPA to outside the MPA allows fishermen to catch fish, often more so than was the case before and ensures that a healthy fish community remains in the protected area (see diagram below). Community based MPAs have proven to be an effective way in sustainable fisheries and maintaining peoples livelihoods. A third benefit is that they can provide an income from eco-tourism when divers pay a

small fee to dive within the MPA. As long as the numbers of divers is restricted and diving is done without touching or interacting with the marine environment, the effects of eco-friendly diving have been proven to be minimal.

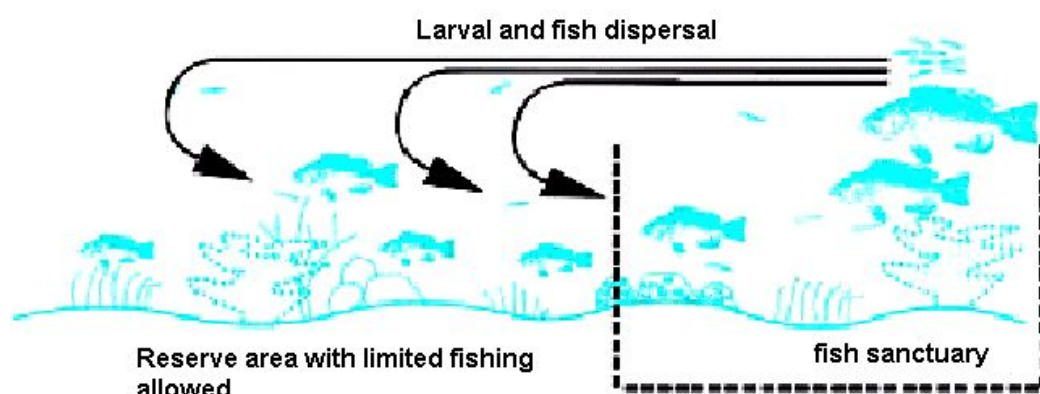


Fig. 3.1. Schematic diagram of MPA functioning. The large, protected fish within the MPA produce larvae which settle and grow outside the MPA where they can be caught by fishermen. In addition, the corals inside the MPA are not disturbed by direct human impacts. One square km of healthy reef can support over 20 tons of fish per year. One square km of damaged/destroyed reef can only produce 3 tons (Bohnsack, 1990).

4 - Methods

In 2005, several surveys were conducted within the MPA which are used as baseline data to compare with the more recent data collection, more than a year later.

The survey method closely follows the one outlined in the 'Coral Reef Monitoring for Management' book put together by the Marine Science Institute of the University of the Philippines, Diliman; the Guiuan Development Foundation Inc. and the Volunteer Service Overseas.

Results from inside and outside the MPA were collected throughout August, 2006. Results from before the installation of the MPA were collected at the beginning of 2005 and in July of 2005. The surveys were carried out at a depth of 12m. This depth was chosen because it usually has the highest coral diversity.

4.1 - Point-intercept transect

For estimating the relative abundance of living and non-living coral on the reef bottom, a benthic point-intercept transect was used by SCUBA divers. "Benthic" refers to the animal and plant life growing on the seabed. A 50m transect line was laid out along a constant depth 12m. A note was made of the benthic cover every 25cm along the line. The total number of points along the transect line was 200. Benthic categories were chosen as follows:

Live hard coral	Other benthos types		
<i>Branching</i>	Soft coral	Other animals	Seagrass
<i>Massive</i>	White dead coral	Turf Algae	Rubble
<i>Flat/encrusting</i>	Dead coral w/ algae	Fleshy macroalgae	Rock and block
<i>Foliose/cup</i>	Sponges	Coralline algae	Sand/Silt



Fig. 4.1. A Coral Cay observer estimating benthic cover every 25 cm along the transect line.

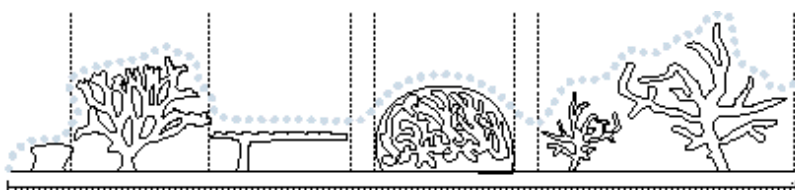


Fig. 4.2. Schematic diagram of a point intercept line laid over different coral lifeforms

From these results, the percentage cover of the various substrate types could be calculated. The results for the benthic surveys can be found in the following section.

4.2 - Fish Visual Census

Fish families were counted and a note was made of their size within a defined area, along the same transect line as used to estimate benthic cover. Two divers swim side by side and count numbers of target fish 5m to either side of the 50m transect line. Swimming speed is controlled and there is a 15-minute waiting period after the line has been laid so as not to disturb the fish and let them come out of hiding. Fish families that were observed were chosen on the basis that they are (a) good indicator species for reef health or (b) important fish for consumption and hence an indicator of overfishing if their numbers are found to be low or fishery recovery if their numbers are found to be relatively high. The following families were counted during the surveys:

Groupers (Epinephelinae)
Barramundi Cod (Cromileptes)

Wrasse (Labridae)
Humphead wrasse

Snapper (Lutjanidae)	Parrotfish (Scaridae)
Sweetlips (Haemulidae)	Bumphead parrot
Emperors (Lethrinidae)	Surgeonfish (Acanthuridae)
Jacks / Trevally	Rabbitfish (Siganidae)
Fusiliers	Rudderfish (Filefish) (Kyphosidae)
Coral Breams (spinecheeks) (Nemipteridae)	Damselfish (Pomacentridae)
Goatfish (Mullidae)	Anthias (Anthiinae)
Triggerfish (Balistidae)	Moorish Idol (Zanclus cornutus)
Butterfly fish (Cheatodontidae)	Angelfish (Pomacanthidae)

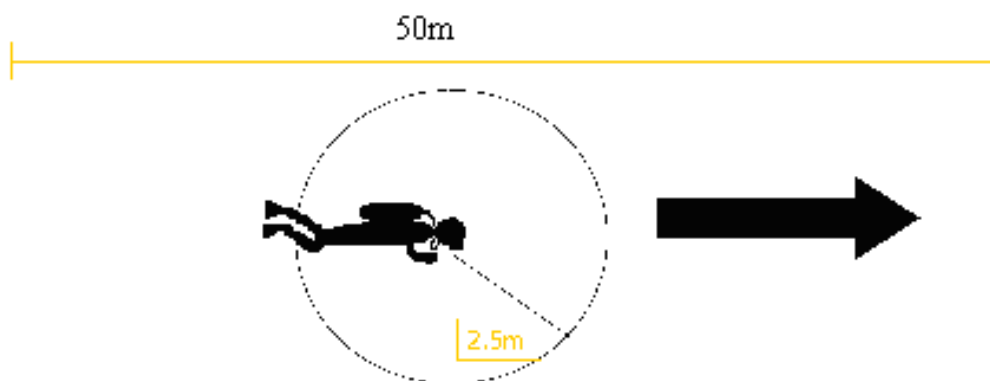


Fig. 4.3. Fish visual survey method used to estimate fish abundance along the 50m line. The diver notes down any target fish seen 2.5m to either side and 5m above. The observer on the other side of the line does the same.

4.3 - Human impacts and abiotic factors

In addition to the fish and benthic data, a fourth observer laid down the transect line for the other observer to follow and made a note of the following factors:

- Transect Orientation
- Depth
- Reef Zone
- Whether the site was sheltered or exposed
- Approximate steepness of the slope
- Horizontal and vertical visibility
- Weather
- Human and natural underwater impacts such as trash, nets, bleaching and coral breakage

A boat marshal made a note of human impacts and drew a sketch map of the area and locations of the transects with the aid of a Global Positioning System (GPS) for future reference. Numbers of fishing boats, trash, gleaners and many other human influences were also recorded.

5 - Results

What follows is a summary of the most important findings from the belt transect (fish abundance estimates), point intercept (benthic cover as a percentage) and general reef health and abiotic (non-living) factors.

5.1 - Changes in fish abundance

Table 5.1. Fish families observed on surveys in common English, latin and Tagalog name.

Fish	Visayan
Groupers (Epinephelinae)	lapu-lapu
Snapper (Lutjanidae)	maya-maya
Sweetlips (Haemulidae)	lipti
Emperors (Lethrinidae)	katambak
Jacks / Trevally	talakitok
Fusiliers	solid
Coral Breams (spinecheeks) (Nemipteridae)	silay
Goatfish (Mullidae)	timbongan
Triggerfish (Balistidae)	pakol
Butterfly fish (Cheatodontidae)	alibangbang
Angelfish (Pomacanthidae)	adlo
Wrasse (Labridae)	labayan
Parrotfish (Scaridae)	molmol
Surgeonfish (Acanthuridae)	indangan
Rabbitfish (Siganidae)	kitong
Rudderfish (Filefish) (Kyphosidae)	ilak
Damselfish (Pomacentridae)	palata
Anthias (Anthiinae)	bilang-bilong
Moorish Idol (<i>Zanclus cornutus</i>)	sanggowanding

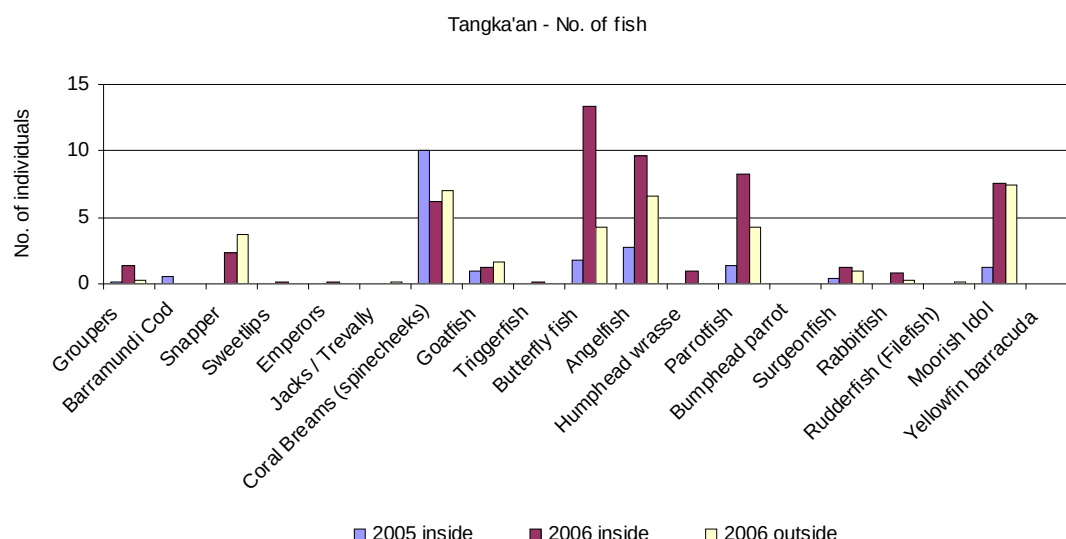


Fig. 5.1. Numbers of fish one year after the MPA instalment. Most fish families show an increase in numbers except coral breams which showed a minimal decrease. However, it should be noted that the number of surveys in 2005 were very limited and conducted during a different season. Nonetheless, there is an indication of higher reef fish numbers inside the MPA in 2006 compared to outside. The most noteworthy result is the higher abundance of butterflyfish within the MPA – an indicator of good

reef health and a very positive result indeed. No real differences can be seen in the commercially important predatory fish. Let it be known that there will be no additional benefits gained from illegal fishing inside the MPA!

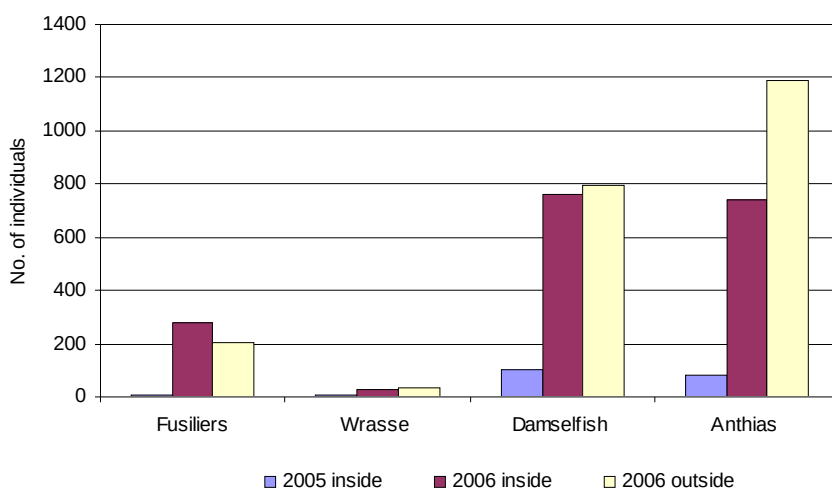


Fig. 5.2. Changes in the numbers of more abundant, smaller fishes observed one year after MPA instalment. All species increased in number though the largest increases were found for damselfish, fusilier and anthia families.

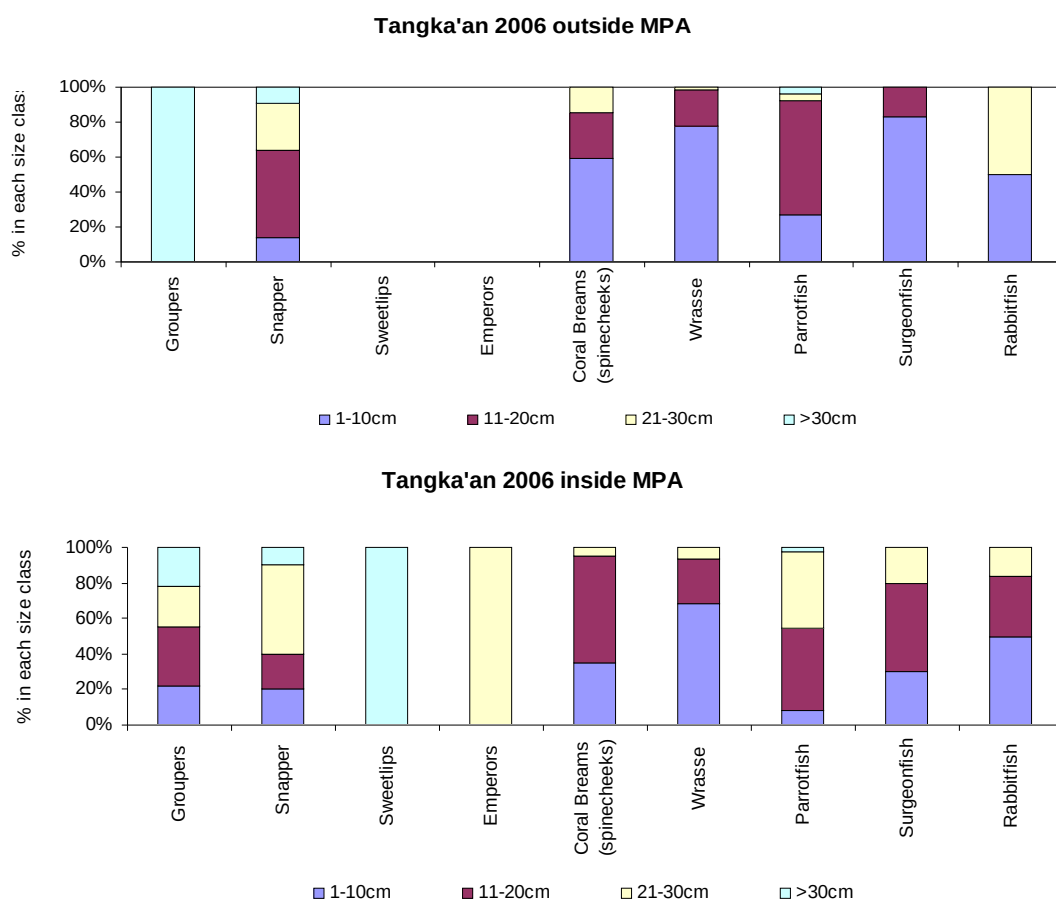
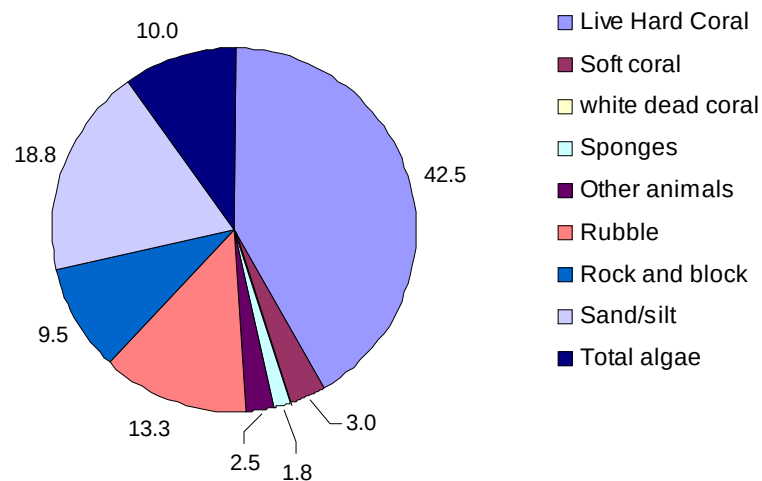


Fig. 5.3. Composition of commercially important fish from 2006 outside (top) and inside (bottom) the MPA. One year after being protected there is a higher percentage of larger fish inside the MPA for most species compared to outside and a more varied size composition. A healthy fish stock will

contain individuals of all sizes. Large adults of predatory fish (groupers, snappers and sweetlips) provide many more offspring than young adults and therefore it is important to let these adults grow to their maximum size.

5.2 - Changes in benthic cover

Tangka'an - benthic cover inside MPA - 2005



Tangka'an - benthic cover inside MPA - 2006

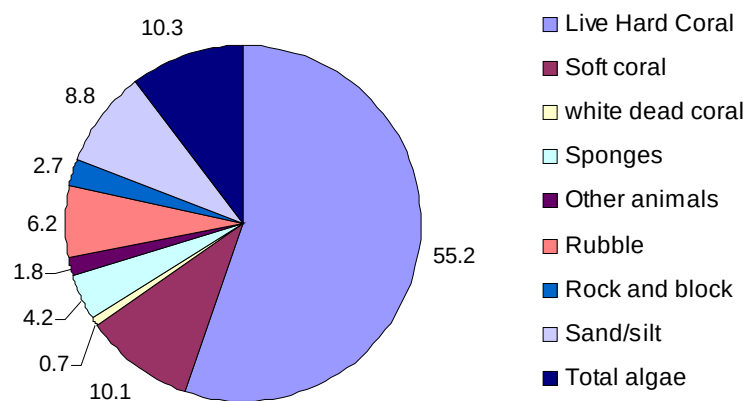


Fig. 5.4. Benthic composition within the MPA in 2005 (**top**) and 2006 (**bottom**). Live hard coral (LHC) cover appeared to increase but extreme caution must be taken with these results as surveys in 2005 were very limited.

Tangka'an - benthic cover outside MPA - 2006

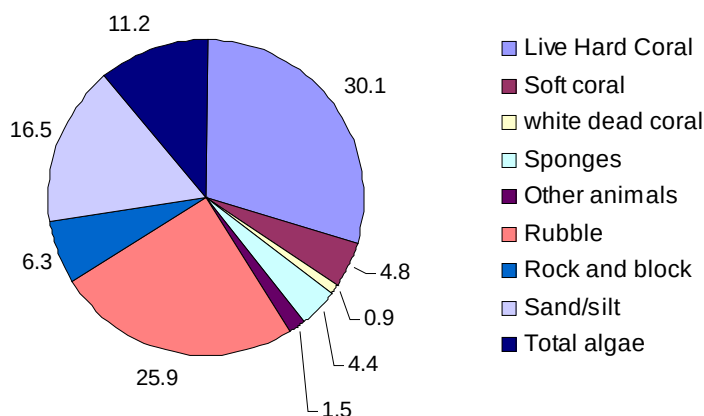


Fig. 5.5. Benthic cover outside the MPA. Reasonable coral cover was found outside the MPA. Results indicate higher proportions of rock, sand, rubble and algae outside the MPA compared to inside. The area inside the MPA appears to contain more hard and soft corals providing a healthy environment in which fish can grow, reproduce and move outside to be caught by the fishermen. Considering the areas both inside and outside already have good reef health, any further positive changes will take at least a few years to become apparent.

5.3 - Human impacts inside and outside the MPA

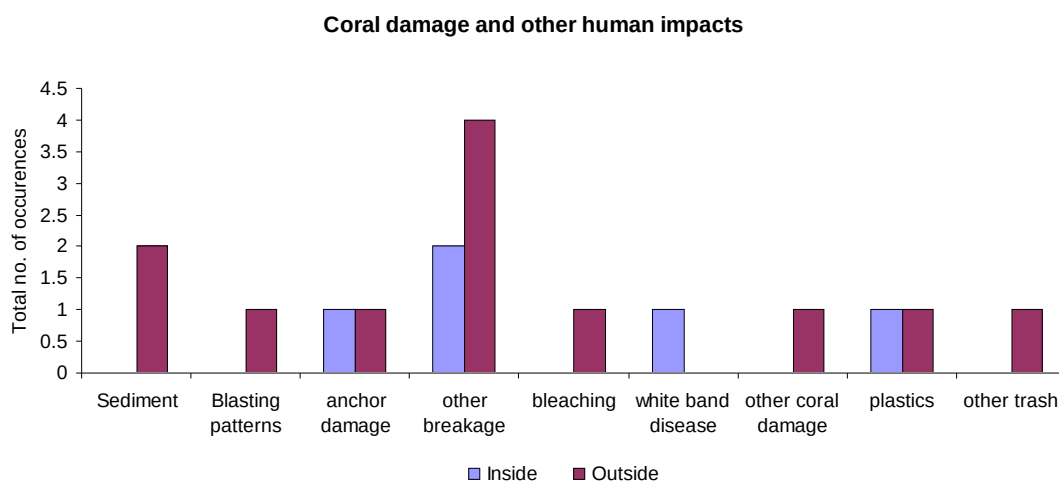


Fig. 5.6. A summary of the coral damage and human impacts found inside and outside the Tangka'an MPA. A greater number of negative impacts were noticed outside of the MPA. Although this is not a protected area as much as possible should be done to protect the areas used for fishing in order to further enhance fish catches..

Whilst coral damage was found both inside and outside the MPA, the amount of damage was greatest outside the MPA. The main concern here would be the increase

in algae covering corals and sandy bottoms between the coral patches (Figs. 5.4 and 5.5). This is a sure sign of pollution from the land that allows algae to flourish and overgrow corals.

Visibility was found to be around 15m on all survey dives. The temperature was around 30 degrees for both the surveys conducted in 2005 and 2006 . Changes to benthic and fish abundance and composition are promising but expected to be minimal given the short time for which the MPA has been established.

6 - Conclusion and recommendations

Results between 2005 and 2006 appear to indicate an increase in hard coral cover but it should be remembered that only 2 surveys were completed in 2005 and only further surveys in the future could establish whether this is the case. Fish stocks were generally greater inside the MPA in 2006 for all fish families compared to 2005. However, the 2005 surveys were low in number and occurred during a different season making true comparisons between the years impossible. Differences in fish stocks inside and outside the MPA in 2006 were minimal but suggest a higher abundance of many species inside the MPA such as butterfly and angelfish indicating a healthy reef environment. Hopefully the situation inside the MPA will continue to improve and provide a healthy fish stock that can be harvested outside the MPA. Fish stocks inside MPAs often take several years before significant increases can be seen and careful management of fishing activities is required to ensure this is the case. Without proper management the MPA will **never** work.



Surveys between selected sites inside and outside the protected area do not indicate a higher commercial fish abundance within the protected area. This is by no means a bad thing given the young age of the MPA. Certain fish such as snapper may be swimming in and out of the sanctuary and therefore, we could expect to encounter similar numbers in both areas. Fish with smaller territories did have higher numbers inside the MPA. The butterflyfish are a good example. Since they are generally associated with good reef health, we can see a relationship with the better coral cover

inside the MPA and the presence of more butterflyfish. In addition, the extra hard coral cover may also be the reason behind the sighting of more parrotfish within the MPA compared to outside given that this is their main food source.

The size composition of fish within the MPA (Fig. 5.3) appears to be better than that outside with a general trend of a more varied and larger size composition. Although 100% of groupers observed outside the MPA were in the largest size category it should be noted that only 2 groupers in total were observed outside the MPA during the surveys compared to 7 inside the MPA. A healthy fish stock will contain individuals of all sizes, as seen within the MPA. It is interesting to note that a large snapper of 12 kg will provide as many offspring as 100 1kg snappers. This really underlines the importance of allowing fish to grow and reproduce in an undisturbed environment so that maximum offspring outputs can be attained.

The coral cover and benthic composition inside and outside the MPA was quite different. There was better hard coral cover inside (55%) the MPA than outside (30%). Dead coral was approximately the same inside and outside the MPA although more coral breakage and damage was observed outside the MPA compared to inside (Fig. 5.6). In time it is hoped that less damage will be observed inside the MPA as no anchors will be dropped by fishing boats. The installation of mooring buoys for fishermen outside the MPA would help prevent further anchor damage. By preventing coral damage inside and outside the MPA, the reef will be healthier and able to support more fish for the fishermen.

An indication of nutrification (too many nutrients in the water from land runoff and pollution) was seen by many areas of algae overgrowth. Algae (in particular *Cyanobacteria*) can out compete and overgrow corals when there is an increase in certain nutrients in the water. This is a more complex problem that requires an integrated approach to the local coastal management. Proper waste disposal and allowing less plastic waste to enter the sea would be a good starting point for the Barangay.

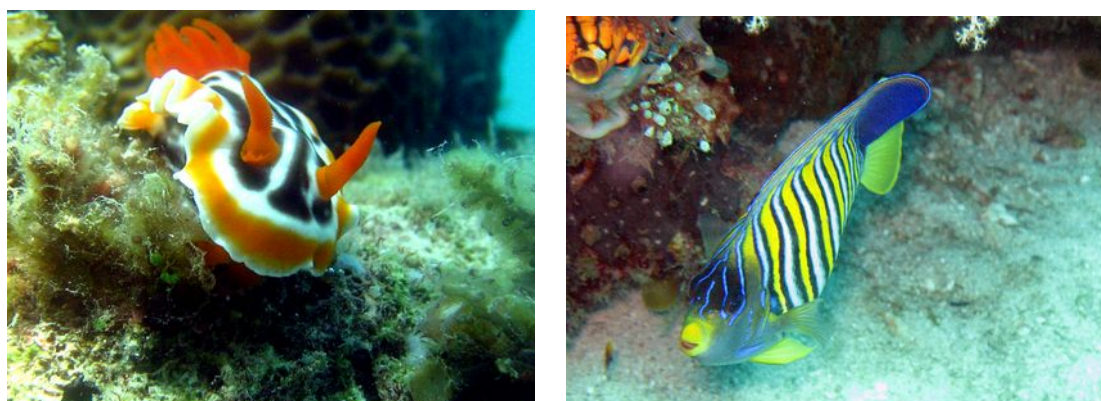


Fig. 6.2. A nudibranch (sea slug) crawls over an algae covered rock (left) whilst a regal angelfish swims close to the coral reef in Tangka'an MPA (right).

The reef morphology (steepness and complexity) inside the MPA at the northern end made surveying difficult in areas of healthy reef cover. Many crevices and drop offs provided rich reef cover and fish abundance (observers notes) but surveying them

proved difficult. The fact that the local dive operators are regularly diving within the MPA is proof of the high aesthetic value of the area.

CCC believes now would be a good time to enhance the management of the MPA. It has been observed that many fisherfolk have been fishing within the MPA. The implementation of the no fishing rules would prevent this. Diver access within the MPA should be allowed to continue to generate income for the community and MPA management but any fishing must be prohibited. Only by proper management in this way will the fishermen be able to realise the true potential of the increased fish yields that the MPA can offer.

Social surveys have been valuable in order to get a better picture of community awareness, appreciation and opinions about the MPA. These surveys have been undertaken by CCC and are currently being processed. Results will be made available in due course. Together with more MPA surveys, a more accurate picture can be made of the current status of the Tangka'an MPA. For now, it is crucial that the MPA wardens watch the area at all times and make sure there are no violations such as illegal fishing and passage inside the MPA. The community must remain involved in future decisions and their voice should be heard. Without community support, the MPA cannot work.

A further recommendation would be to combine the MPA of Tangkaan with the MPA of Santa Sofia to set aside a 900m area of coastline. Larger MPAs have a far better chance of recovering fish stocks. At this time, the management of Tangkaan MPA could be enhanced by the inclusion of the fisherfolk as a force to keep others from fishing within its boundaries. The combined efforts of both Barangays may also be the key to successful management and law enforcement. It will also save on costs such as marker buoys and help improve inter-barangay relationships. The MPA at Molopolo/Sta. Cruz is a co-managed MPA between the two Barangays and has been established for the past 10 years. The MPA is respected by the local fishermen and many shoals of large snapper and emperors can always be seen swimming in its waters.

7 - Acknowledgements

Coral Cay would like to thank all the CCC volunteers for their hard work and dedication to providing accurate survey results. We would also like to extend our gratitude to the Barangay council of Tangka'an and Captain Villiasaris for allowing us to dive within the MPA and their continued support and motivation in creating a sustainable fisheries management in their Barangay. We also thank the Municipal Office of Padre Burgos for assisting us in many ways.